

REMARKS / ARGUMENTS

The lengthy Final Office Action by the Examiner in this application, together with the references cited, have been given careful consideration. Following such consideration, Applicant respectfully requests that the Examiner reconsider the claims, together with the following comments, and allow the application.

It appears from the Final Office Action that Applicant has failed to clearly point out to the Examiner the patentable distinction that is believed to exist between the claimed invention and the art cited by the Examiner. Applicant shall now try to explain in greater detail the patentable differences between the cited references and the invention as presently set forth in the claims.

As the Examiner well knows, the present invention relates to a multi-cell battery having a plurality of joined current collectors. As noted in the specification, it is not unusual for multi-layered cells to have ten (10) or more cathode current collector tabs that must be joined together and attached to a cathode lead. Similarly, the same battery would have five (5) or more anode current collector tabs that must be joined together and attached to an anode lead. Problems exist with respect to joining such a large number of tabs together. Specifically, methods of joining tabs known heretofore exerted significant stress on the tabs and current collector layers when the tabs were ultrasonically welded together and bent backwards toward the battery. More specifically, the conventionally known method of joining current collector tabs produced a unique, identifiable structure having the aforementioned stress problem.

Typically, a battery is formed by stacking a plurality of cathode sections and anode sections onto each other. Each cathode section is comprised of two (2) layers of a cathode film having a metal screen/metal mesh or a sheet of perforated metal therebetween. This layer of metal screen is the current collector and includes an outwardly extending tab or strip. An anode section is similarly comprised of two (2) layers of an anode film having a current collector therebetween. The current collector is formed of a metal screen/metal mesh or a sheet of perforated metal, and has an outwardly extending tab extending therefrom. When ten (10) or more layers of cathode and anode sections are stacked onto each other, the current collector tabs

extend to one side thereof. Typically, these current collector tabs were pressed together and welded. The tabs could be joined together at the center of the stack, or could be joined together at the lower end of the stack by pressing the current collectors down onto the surface supporting the stack of battery sections. This latter assembly of the current collectors can be illustrated with reference to FIG. 6 of U.S. Publication No. 2002/0081491 (cited by the Examiner). If the “gathering 28” shown in FIG. 6 is bent from its vertical position down to a horizontal position, wherein the lower surface of the “gathering 28” is aligned with the lower surface of the lower layer of the battery stack, the Examiner can envision the manner in which current collectors were stacked and welded together. FIG. 10 of the ‘665 Japanese reference (cited by the Examiner) also illustrates the prior method of joining collector tabs. The current collectors that are stacked, joined together and welded in such a fashion, are bent into a U-shaped or generally U-shaped configuration, as shown in FIG. 6 of the ‘491 publication and FIG. 5B of the ‘665 Japanese reference. When the joined, i.e., welded, stack of tabs are bent toward the battery, considerable stress is exerted on the lowermost current collector tabs as they are required to be bent around the uppermost current collector tabs. Applicant respectfully submits that the stress exerted when bending such an assembly of tabs is not a mere speculation, but is actual, physical occurrence because the lowermost, outermost collector tabs must bend around the innermost collector tabs. Since the collector tabs are welded together, lateral movement of one (1) collector tab relative to the other collector tab is not permitted. Thus, the outermost collector tabs must stretch to be bent into a configuration shown in FIG. 6 of the ‘491 publication. As noted above, the ‘665 Japanese reference shows a conventional method of assembling current collector tabs where they are joined together on a surface and then bent upward. The ‘665 Japanese reference shows *only* four (4) collector tabs being joined together. As indicated in the specification of the present invention, when ten (10) or more tabs are joined and welded, the battery itself is thicker, as is the resulting welded area. The thicker the welded area, the greater the stress on the lowermost collector tabs. It is respectfully submitted that the structure shown in the ‘491 publication and the ‘665 Japanese reference produce specific, identifiable structures as a result of the method of joining, welding and bending the current collector tabs as outlined above.

THE PRESENT INVENTION

The claims of the present invention define a multi-cell lithium-ion or lithium-ion polymer battery having a tab weldment having a specific configuration that results from a different method of joining welding and bending the collector tabs. In this respect, the tab weldment configuration defined in the present claims may be best illustrated by the method of its fabrication. In this respect, the Examiner's attention is directed to FIG. 6A through 6D of the present application. As shown therein, the tab weldment according to the present invention is formed by collecting the collector tabs at a location offset from the body of the battery cell. In this respect, "XL" in the drawings shows the surface of the lowermost section of the cell body. As seen in FIG. 6A, the collector tabs are collected at a location below surface "XL." The collector tabs are then welded at that location, as shown in FIG. 6B. In FIG. 6C, the ends of the current collector tabs are trimmed and the tab weldment is then bent around axis "A" that exists within the confines of the cell body. (See axis "A" in FIG. 6D of application). In this respect, it is respectfully submitted that an unusual tab weldment is produced, and that the unique tab weldment is the result of the method of forming it. In this respect, in the present situation, Applicant is claiming a cell body having a unique tab weldment that can only be described by the manner of its fabrication. By collecting and joining the current collector tabs at a location outside the cell body and then wrapping them at a location within the cell body, sufficient slack is provided in the lowermost collector tabs to avoid the tugging and stress exerted thereon when formed as in a manner as conventionally known and described above.

Claim 8 in its present form recites the following:

"a tab weldment joining the free ends of said tabs but leaving said intermediate portions of said tabs unattached to each other, *said tabs being welded together when said tabs are stacked together at a location offset from said cell body*, such that when said tabs are folded into a generally U-shaped configuration about an axis within the surfaces of the cell body said unattached intermediate portions form a smooth layered, generally U-shaped structure with said tab weldment disposed adjacent said one side of said cell body." {italics added}

A tab weldment formed in the foregoing manner defines a unique structure that is distinguishable from the cited art. A reduction in the stress in the current collector tabs is a result of the unique tab weldment structure.

EXAMINER'S REJECTIONS

Referring to the Examiner's rejections, each of the rejections basically set forth similar arguments that focus on (1) Applicant's failure to use the term "generally" when defining the U-shaped structure of the tab weldment, and (2) Applicant's arguments with respect to the reduction or minimization of stresses in the current collector tabs.

With respect to Applicant's failure to use the term "generally" in the prior Response, Applicant's attorney acknowledges his failure to do so. It was an unintended oversight to omit the term "generally." However, it is respectfully submitted that such omission does not change in any way the patentable differences between the invention as claimed and the cited references, for the reasons set forth above.

With respect to Applicant's arguments regarding the stresses in the current collector tabs, Applicant intended such arguments to emphasize the advantages of the structure claimed, and did not intend per se to argue patentability under this aspect alone. A tab weldment configuration that is formed by collecting, joining and welding the current collector tabs at a location offset from the cell body, reduces the stress in the current collector tabs as compared to structures known heretofore. In this respect, as noted in the specification, current collectors are typically formed of a metal mesh/metal screen or sheet of perforated metal having a thickness of about 25 μ m to 50 μ m. As will be appreciated, the minor stresses in such thicknesses of metal can cause tearing of the current collector tabs thus affecting the power capacity of the battery or possibly shorting the same.

Referring specifically to the claim language, Applicant concedes that it is known to provide a plurality of cell sections, a plurality of current cathode collectors and that cells known heretofore have had tab weldments joined at the ends of the tabs. However, the prior art does not teach, suggest or show a tab weldment defined by the "tabs being welded together when said tabs are stacked together at a location offset from said cell body" such that when the tabs are folded

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into a generally U-shaped configuration about an axis within the surface of the cell body, the unattached intermediate portions form a smooth layered, generally U-shaped structure.

Applicant respectfully submits that although the tab weldment as defined above may not appear to be significantly different from that shown in the cited art, by forming a tab weldment in this manner, the stresses in the current collector tabs are reduced, thereby reducing the likelihood of failure or damage to the battery cell. A tab weldment according to the present invention is defined by the manner of its formation, and it is respectfully submitted that such weldment is a unique structure as a result of such a method of fabrication.

With respect to the references cited by the Examiner, Applicant respectfully submits that if the Examiner reviews such references in light of the foregoing comments, he will find that none of the cited references teaches, suggests or shows a structure defined by collecting the current collector tabs "at a location offset from the cell body," and then joining and welding the current collector tabs at that location prior to bending the tabs toward the cell body into a generally U-shaped configuration. For the foregoing reasons, Applicant respectfully requests that the Examiner reconsider the claims in their present form in light of the foregoing comments, and allow the application. Should the Examiner need additional information, it is requested that he contact the undersigned attorney at the telephone number set forth below.

Respectfully submitted,



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Date: February 12, 2004

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